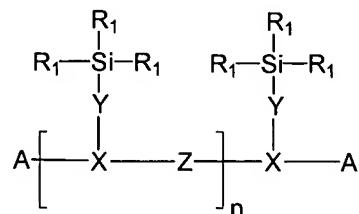


**We claim:**

1. A macromonomers comprising a molecular weight of at least about  $M \geq 500$  g/mol containing siloxane groups that are characterized by the following formula:



wherein

$A$  is a polymerizable moiety;

$R_1$  is a  $C_1$  to  $C_{18}$  oxyalkyl, a  $C_5$  to  $C_{18}$  oxycycloalkyl or a  $C_5$  to  $C_{15}$  oxyaryl,  $C_1$  to  $C_{18}$  alkyl, a  $C_5$  to  $C_{18}$  cycloalkyl or a  $C_5$  to  $C_{15}$  aryl or heteroaryl;

$X$  is  $N$  or a substituted or unsubstituted  $C_1$  to  $C_{18}$  alkylene, a  $C_1$  to  $C_{18}$  oxyalkylene or  $C_1$  to  $C_{18}$  carboxyalkylene;

$Y$  is a  $C_1$  to  $C_{18}$  alkylene,  $C_1$  to  $C_{18}$  oxyalkylene or a urethane -O-CO-NH- linking moiety;

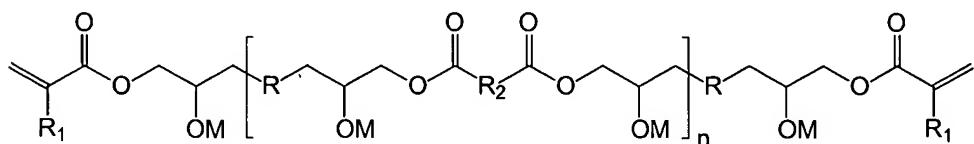
$Z$  is a  $C_1$  to  $C_{18}$  alkylene, a  $C_5$  to  $C_{18}$  cycloalkylene or a  $C_5$  to  $C_{15}$  arylene or heteroarylene, and

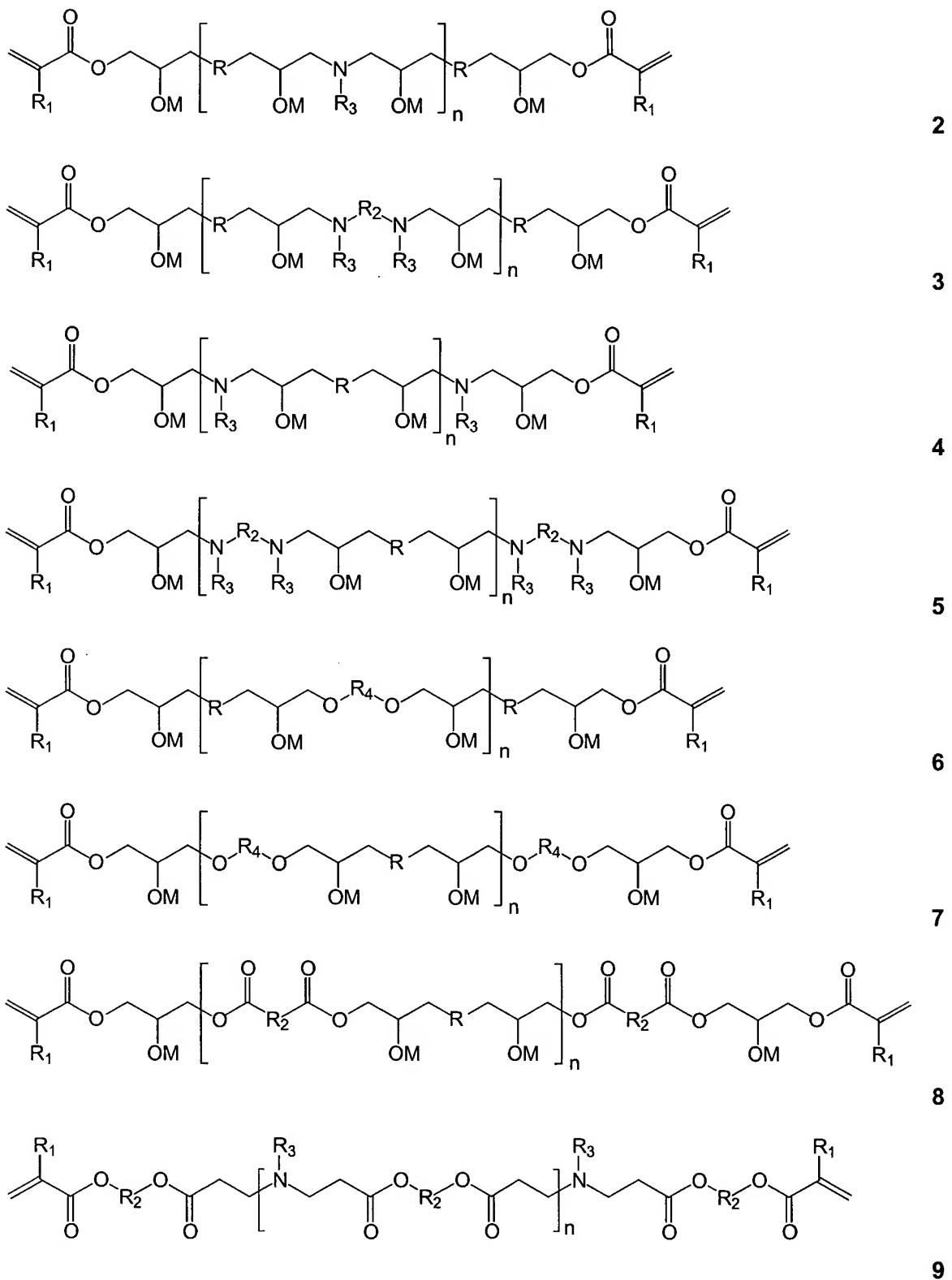
$n$  is an integer.

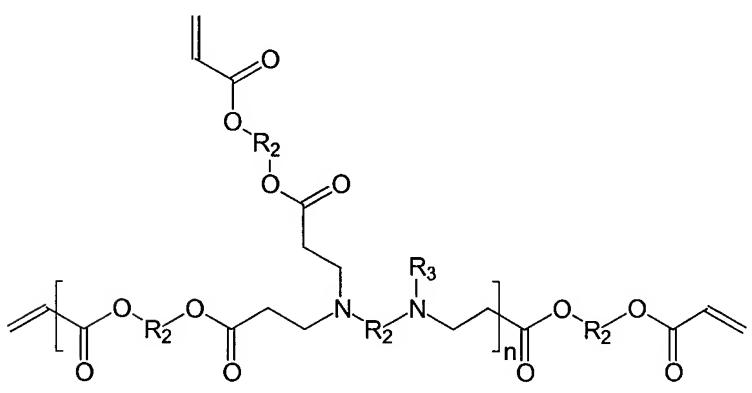
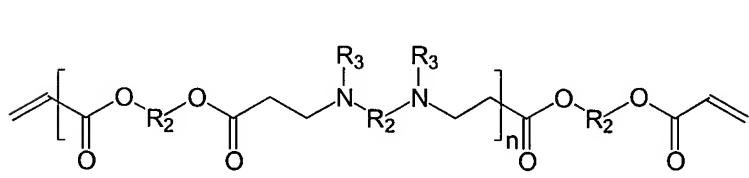
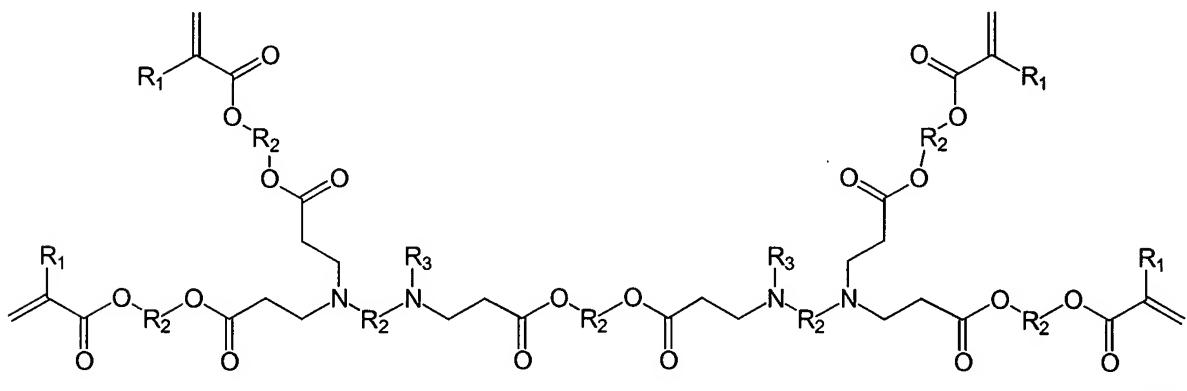
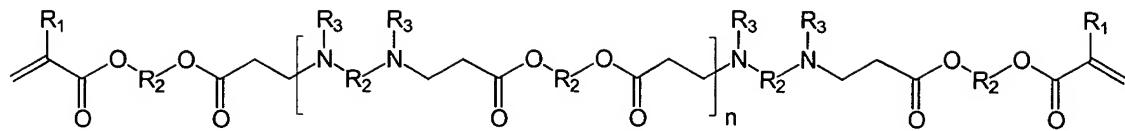
2. A macromonomer as in claim 1, wherein said polymerizable moiety has an olefinic double bond.

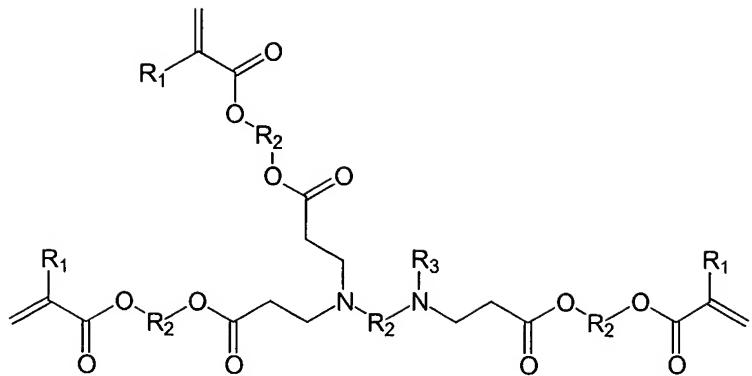
3. A macromonomer as in claim 2, wherein said polymerizable moiety is selected from the group consisting of acrylate and methacrylate.

4. A macromonomers comprising:





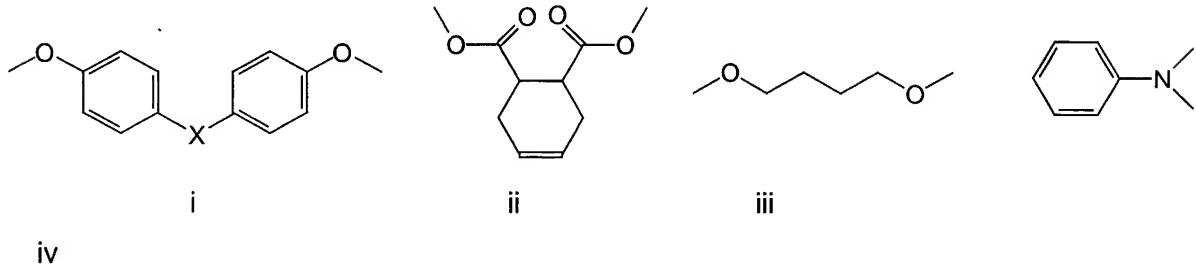




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wherein

R is a residue derived from a diepoxide and having a formula selected from the group consisting of i, ii, iii, iv as follows:

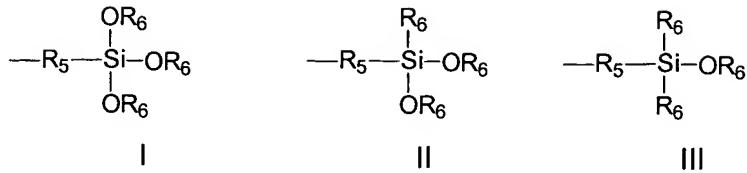


whereby X is  $\text{C}(\text{CH}_3)_2$ ,  $-\text{CH}_2-$ ,  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{CO}-$ ,  $-\text{SO}_2-$ ;

$\text{R}_1$  denotes hydrogen or a substituted or unsubstituted  $\text{C}_1$  to  $\text{C}_{18}$  alkyl,  $\text{C}_5$  to  $\text{C}_{18}$  substituted or unsubstituted cycloalkyl, substituted or unsubstituted  $\text{C}_5$  to  $\text{C}_{18}$  aryl or heteroaryl,

$\text{R}_2$  is a difunctional substituted or unsubstituted  $\text{C}_1$  to  $\text{C}_{18}$  alkylene,  $\text{C}_2$  to  $\text{C}_{12}$  alkenyl,  $\text{C}_5$  to  $\text{C}_{18}$  substituted or unsubstituted cycloalkylene,  $\text{C}_5$  to  $\text{C}_{18}$  arylene or heteroarylene,

$\text{R}_3$  denotes a substituted or unsubstituted  $\text{C}_1$  to  $\text{C}_{18}$  alkyl,  $\text{C}_2$  to  $\text{C}_{12}$  alkenyl,  $\text{C}_5$  to  $\text{C}_{18}$  substituted or unsubstituted cycloalkyl,  $\text{C}_6$  to  $\text{C}_{12}$  aryl or  $\text{C}_7$  to  $\text{C}_{12}$  aralkyl, or a siloxane moiety I, II or III



$R_4$  is a substituted or unsubstituted  $C_6$  to  $C_{12}$  arylene

$R_5$  is a difunctional substituted or unsubstituted  $C_1$  to  $C_{18}$  alkylene,  $C_2$  to  $C_{12}$  alkenyl,  $C_5$  to  $C_{18}$  substituted or unsubstituted cycloalkylene,  $C_5$  to  $C_{18}$  arylene or heteroarylene, preferably  $CH_2CH_2CH_2$ ,

$R_6$  denotes a substituted or unsubstituted  $C_1$  to  $C_{18}$  alkyl, substituted or unsubstituted  $C_1$  to  $C_{18}$  alkylene,  $C_2$  to  $C_{12}$  alkenyl,  $C_5$  to  $C_{18}$  substituted or unsubstituted cycloalkyl,  $C_6$  to  $C_{12}$  aryl or  $C_7$  to  $C_{12}$  aralkyl,

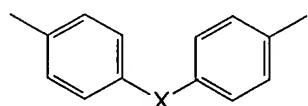
M is a siloxane moiety I, II or III or it is a protection groups for hydroxylic moieties selected from the group consisting of an ether, an ester or a urethane group;

$R_5$  is a difunctional substituted or unsubstituted  $C_1$  to  $C_{18}$  alkylene,  $C_2$  to  $C_{12}$  alkenyl,  $C_5$  to  $C_{18}$  substituted or unsubstituted cycloalkylene,  $C_5$  to  $C_{18}$  arylene or heteroarylene,

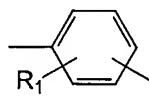
$R_6$  denotes a substituted or unsubstituted  $C_1$  to  $C_{18}$  alkyl,  $C_2$  to  $C_{12}$  alkenyl, substituted or unsubstituted  $C_1$  to  $C_{18}$  alkylene,  $C_5$  to  $C_{18}$  substituted or unsubstituted cycloalkyl,  $C_6$  to  $C_{12}$  aryl or  $C_7$  to  $C_{12}$  aralkyl,

and n is an integer.

5. A macromolecule as in claim 4, wherein  $R_4$  is selected from VII and VIII as follows:



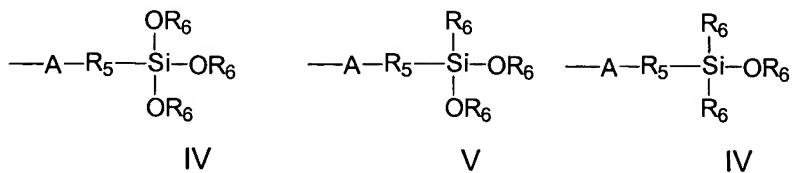
VII



VIII

wherein X is  $C(CH_3)_2$ ,  $-CH_2-$ ,  $-O-$ ,  $-S-$ ,  $-CO-$ , or,  $-SO_2-$ .

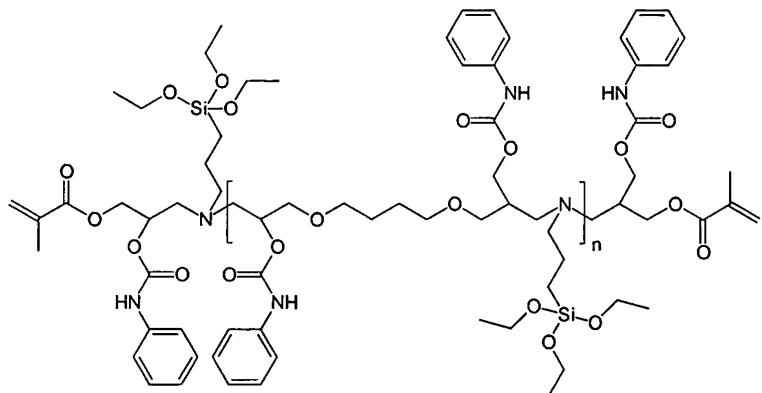
**6.** A macromolecule as in claim 4, wherein M is selected from the group consisting of



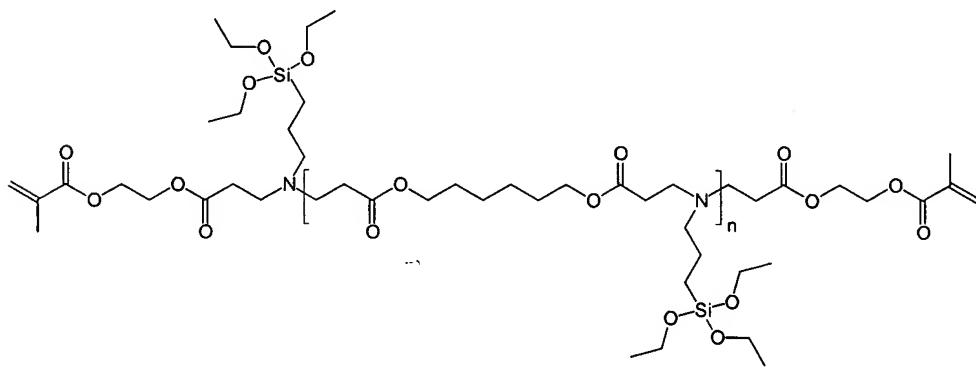
wherein A is an ether, an ester or an urethane linking group.

**7.** A macromonomer of claims 1 synthesized in presence of catalysts or in solvents selected from the group consisting of THF, toluene and triethyleneglycol bismethacrylate.

**8.** Macromonomers of claim 1 wherein said macromonomer is characterized by the following formula:



**9.** Macromonomers of claim 1 wherein said macromonomer is characterized by the following formula:



**10.** A composition comprising the macromonomer of claim 1 usable

- a) as monomers in dental composition that further comprises a polymerizable monomer, an organic or inorganic acid or a monomer that has at least an acidic moiety, a stabilizer, an initiator, pigments and an organic or inorganic filler; or
- b) for filler surface modification or
- c) as precursor for siloxane condensation products containing active polymerizable moieties
- d) as precursor for preparation of nanoparticles containing active polymerizable moieties.

11. A composition as in claim 6 comprising at least a macromonomer containing at least one siloxane group, a polymerizable monomer, an organic or inorganic acid or a monomer that has at least an acidic moiety, a stabilizer, an initiator, pigments and an organic and/or inorganic filler.

12. A composition as in claim 11 wherein said polymerizable monomer is a mono- and polyfunctional (meth)acrylate, in a content of 5 to 80 wt-%.

13. A composition as in claim 12, wherein said polymerizable monomer is selected from the group consisting of polyalkylenoxide di- and poly-(meth)acrylate, urethane di- and poly(meth) acrylate, and vinyl-, vinylen-, vinyliden-acrylate- or methacrylate, alkoxyisilyl (meth)acrylate.

14. A composition as in claim 13, wherein said polymerizable monomer is selected from the group consisting of diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, 3,(4),8,(9)-dimethacryloyloxymethyltricyclo decane, dioxolan bismethacrylate, glycerol trimethacrylate, and furfuryl methacrylate.

15. A composition as in claim 11 wherein said organic acid is selected from the group consisting of p-toluene sulfonic acid, ascorbic acid, citric acid, and maleic acid.

16. A composition as in claim 11 wherein said acidic polymerizable monomer is selected from the group consisting of pentaerythrol triacrylate monophosphate, dipentaerythrol pentaacrylate monophosphate, methacrylic acid, and acrylic acid.
17. A macromonomer as in claim 1 wherein said polymerization initiator is a thermal initiator, a redox-initiator or a photo initiator.
18. A macromonomer as in claim 17 wherein said photo initiator is chamfer quinone an/or a diaryliodonium salt, a triarylsulfonium salt or a pyridinium salt.
19. A macromonomer as in claim 11 wherein said filler is an inorganic filler and/or an organic filler.
20. A macromonomer as in claim 11 wherein said stabilizer is a radical absorbing monomer such as hydrochinonmonomethylether, hydrochinondimethylether, BHT, phenothiazine.
21. A macromonomer as in claim 11 that is usable as dental restorative material for filling and restoring teeth, making inlays and onlays, as core build-up materials, for artificial teeth, for sealing and surface modification materials or that is usable as temporary crown and bridge material.
22. A macromonomer as in claim 11 that is usable as a temporary crown and bridge material.
23. A macromonomer as in claim 10 that comprises an inorganic or organic filler that is modified using siloxane containing macromonomers of claim 1.
24. Macromonomers of claim 10 usable for filler surface modification that occurs in combination with basic catalysts selected from the group consisting primary amines, primary tertiary amines primary secondary amines, secondary amines, tertiary amines and mixtures thereof in, optionally in the presence of solvents.

**25.** Macromonomers of claim 10 usable as precursors for siloxane condensation products containing active polymerizable moieties that are applicable as polymerizable monomers for dental material optionally in presence of further hydrolysable compounds of Silicium or Ba, B, Al, Ti, In or other transition element.